## 13-B LIGHT AND GLARE: CONVEYANCE

FINAL ENVIRONMENTAL IMPACT STATEMENT

Brightwater Regional Wastewater Treatment System

**APPENDICES** 



#### **Final**

# **Appendix 13-B Light and Glare: Conveyance**

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#### Introduction

King County has prepared a Draft Environmental Impact Statement (Draft EIS) and Final Environmental Impact Statement (Final EIS) on the Brightwater Regional Wastewater Treatment System. The Final EIS is intended to provide decision-makers, regulatory agencies and the public with information regarding the probable significant adverse impacts of the Brightwater proposal and identify alternatives and reasonable mitigation measures.

King County Executive Ron Sims has identified a preferred alternative, which is outlined in the Final EIS. This preferred alternative is for public information only, and is not intended in any way to prejudge the County's final decision, which will be made following the issuance of the Final EIS with accompanying technical appendices, comments on the Draft EIS and responses from King County, and additional supporting information. After issuance of the Final EIS, the King County Executive will select final locations for a treatment plant, marine outfall and associated conveyances.

The County Executive authorized the preparation of a set of Technical Reports, in support of the Final EIS. These reports represent a substantial volume of additional investigation on the identified Brightwater alternatives, as appropriate, to identify probable significant adverse environmental impacts as required by the State Environmental Policy Act (SEPA). The collection of pertinent information and evaluation of impacts and mitigation measures on the Brightwater proposal is an ongoing process. The Final EIS incorporates this updated information and additional analysis of the probable significant adverse environmental impacts of the Brightwater alternatives, along with identification of reasonable mitigation measures. Additional evaluation will continue as part of meeting federal, state and local permitting requirements.

Thus, the readers of this Technical Report should take into account the preliminary nature of the data contained herein, as well as the fact that new information relating to Brightwater may become available as the permit process gets underway. It is released at this time as part of King County's commitment to share information with the public as it is being developed.

## **Purpose**

The Brightwater Conveyance System would transport wastewater to and from the treatment plant and include the following primary components:

- Influent pipeline, primarily constructed in tunnels, for carrying untreated wastewater to the treatment plant
- Effluent pipelines, primarily constructed in tunnels, for carrying treated wastewater from the plant to the outfall
- Pump stations to lift the wastewater to higher elevations (depending on the alternative selected)
- Portals to support tunneling construction and to contain certain permanent facilities for operation (depending on the conveyance alternative selected)

This technical memorandum addresses the following topics:

**Regulations and Criteria** – This section summarizes light regulations for the local jurisdictions and presents illumination criteria for common outdoor areas.

**Brightwater Conveyance System Alternatives** – This section summarizes the alignments and portal locations for the three Brightwater Conveyance System Alternatives.

**Affected Environment** – This section provides site-specific information collected at the proposed portal locations. The site-specific information includes existing light sources, nearby land uses, topography, and the sensitivity of the sites to light impacts.

**Impacts** – This section describes the general potential light and glare impacts that could occur during the construction and operation of the proposed Brightwater Conveyance System Alternatives. The potential for light and glare impacts is greatest at the portal locations; therefore, impacts at portals are emphasized.

**Mitigation** – This section summarizes potential light and glare mitigation measures that have been used for the construction and operation of conveyance systems. These mitigation measures may be used for the Brightwater Project.

## **Regulations and Criteria**

Lighting regulations for jurisdictions that have them are summarized below. None of these codes include provisions for regulating illumination during construction. Also, regulations pertaining to light and glare generally do not have quantitative standards. For example, the Snohomish County Code states only that lighting shall be hooded or shielded to protect surrounding properties or rights-of-way from glare.

#### **Edmonds**

Light/Glare (EMC 17.60)

Lighting shall not be used in such a manner that produces glare on public streets, highways and neighboring property. Arc welding, acetylene torch cutting or similar processes shall be performed so as not to be seen from any point beyond the outside of the property.

#### Lake Forest Park

*Lighting (LFPMC 18.50.100)* 

All floodlighting provided in this chapter to illuminate any exterior area or building shall be so arranged as to direct light away from adjoining premises and public thoroughfares. (773 3, 1993).

#### Mountlake Terrace

Artificial Light and Glare (MTMC 19.120.030)

Uses producing artificial light, utilizing light for night operation, or causing glare shall:

A. Not impair use of or safety of any road due to strong dazzling artificial light directed at oncoming motor vehicles, or strobe lights projecting off site or toward streets, or lights imitating traffic signal lights.

- B. Protect residential uses from artificial light during periods of darkness by shading the luminaire and/or screening abutting property lines.
- C. Shield light generated by arc welding, acetylene torch cutting, or similar processes in a manner which prevents such light from being visible from any point beyond the outside of the property.
- D. External lighting on residential property shall be directed and shielded appropriately to avoid creating a nuisance or hazard to passing traffic and neighboring properties. (Ord. 2074 9.1(C), 1995).

#### Snohomish County

Lighting (Title 30.22.130 (60(b)) SCC)

Artificial lighting shall be hooded or shaded so that direct outside lighting, if any, will not result in glare when viewed from the surrounding property or rights-of-way.

Lighting (Title 30.22.130 (14(b)) SCC)

All lighting shall be shielded to protect adjacent properties.

#### Woodinville

Light/Glare (WMC 21.14.110 Site Lighting)

- A. Lighting provided on sites shall utilize energy-efficient light sources.
- B. All lighting shall comply with the Washington State Energy Code with respect to the selection and regulation of light sources.
- C. Glare from light sources shall not trespass onto adjacent properties or rights-of-way.
- D. Design of interior and exterior lighting levels shall conform to the recommendations of the Illuminating Engineering Society's "Lighting Handbook", 8th Edition, or as may hereafter be amended. (Ord. 175 § 1, 1997).

In addition to these local regulations, the Washington Industrial Safety and Health Act (WISHA) includes regulations regarding worker safety. The regulation stated in the Washington Administrative Code (WAC 296-800-21005) requires that a contractor provide and maintain adequate lighting for all work activities. This includes having adequate light for employees to see nearby objects that might be a potential hazard or to see to operate emergency controls or other equipment.

## Light and Glare Criteria

The Illuminating Engineering Society of North America (IESNA) provides recommendations for site illumination, IESNA's RP-33-99 (IESNA 1999). The IESNA guidelines are intended to minimize light and glare associated with exterior lighting. IESNA recommends pre-

curfew and post-curfew light levels for various types of surroundings. Pre-curfew is defined as the period from sunrise to 10 p.m.; post-curfew is from 10 p.m. to sunrise.

## **Brightwater Conveyance System Alternatives**

Three alternative conveyance system alignments are being evaluated for the Brightwater Project:

- Route 9–195th Street.
- Route 9–228th Street
- Unocal

The alignments of these three conveyance system alternatives are shown in Figures 1 through 3.

Because most of the Brightwater Conveyance System would consist of tunnels located between 40 and 450 feet underground, potential light and glare impacts are greatest at portal locations (portal siting areas). Portals provide access from the ground surface for launching and receiving the equipment used to construct the conveyance system tunnels. Construction activities at the portals would last between one and four years.

For the Brightwater Project, portal siting areas are 2,000-foot diameter (72-acre) areas where a minimum of one acre would be selected for portal construction (candidate sites). Between two and four candidate sites have been identified within or near each portal siting area.

The portal siting areas are designated as either primary or secondary. Primary portal siting areas would likely be used and have been identified along each corridor at intervals of approximately 20,000 feet. Secondary portals may be required based on geotechnical analysis performed during final design; however, these portals are not expected to be used. A decision about the need for secondary portals will not be made until the final design is complete. If needed, secondary portals may be used for temporary ventilation, ground improvement, and/or grouting supply. If required, secondary portals would be located within approximately 10,000 feet of another primary or secondary portal. The Brightwater Conveyance System Alternatives will require between four (Unocal Alternative) and seven (Route 9-228th Alternative) primary portals, depending on the alternative.

The proposed portals and permanent facilities associated with the three Brightwater Conveyance System alternatives are listed in Table 1. These sites represent areas where greatest potential for light and glare impacts would occur during construction (portals) and during operation (permanent facilities).

**Table 1. Conveyance System Portals and Permanent Above-Grade Facilities Requiring Lighting** 

Alternatives	Primary Portals	Secondary Portals	Permanent Above-Grade Facilities
Route 9-195th	5, 11, 19, 41,	23, 27, 45, 7	Odor control facilities at Portals 11, 41, 44, 5
Street	44		Dechlorination at Portal 5
Route 9-228th	11, 19, 26,	22, 24, 30, 37	Odor control facilities at Portals 11, 26, 41, 44
Street	33, 39, 41, 44		Dechlorination at Portal 26
Unocal Alignment	3, 7, 11, 14	5, 10, 12, 13	Odor control facilities at Portals 11, 7, 14
			Pump station at Portal 11

#### **Affected Environment**

Existing lighting level along the alternative corridors varies, depending on land uses, activities, and street lighting. Some portal locations have no or little existing lighting while others areas have commercial or industrial lighting levels or are adjacent to ballparks that have lighting systems for night games.

#### Route 9-195th Street Alternative

Table 2 summarizes the adjacent land uses, major existing light sources, and site topography at the proposed Route 9-195th Street portals. The sensitivity of the candidate sites to potential light and glare impacts is also listed in Table 2, based on these three characteristics.

Portals located in residential areas and adjacent to roadways can be more sensitive to light and glare impacts. Thus, for the Route 9-195th Street Alternative, Portal 44 would be the primary portal most sensitive to light and glare impacts, while Portal 11 would be least sensitive. The remaining three primary portals (Portals 5, 19, and 41) are located areas of mixed land use.

**Table 2. Summary of Existing Light Conditions at the Route 9-195th Street Alternative Portals** 

Portals  Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
Primary Po	rtals			
		Porta	al 11	
A	Light industrial and commercial	Street lighting on NE Bothell Way and Juanita Drive NE, minimal, if any, lighting for commercial/ industrial buildings and parking lots; no street lighting on NE 175th Street in proximity of the site	Open low area with gentle uphill to the northeast; no trees	Low
В	Light industrial and commercial	Street lighting on NE Bothell Way and Juanita Drive NE, minimal, if any lighting for commercial/ industrial buildings and parking lots; not street lighting on NE 175th Street in proximity of the site	Low area with gentle slope uphill to the northeast; a few small deciduous trees (20-30 ft.) along southern and southwestern site borders	Low
С	Urban commercial, residential	Street lighting and lighting associated with buildings and parking lots	Gentle slope uphill to the northwest; a few small deciduous trees along NE 181st Street	Medium
		Porta	al 44	
С	Rural residential and forested	Minimal street lighting on 80th Avenue NE	On steep slope uphill to the east, dense wooded area – deciduous/ evergreen mixture (100+ ft.)	High
D	Rural residential and forested	Minimal street lighting on 80th Avenue NE, no street lighting on NE 195th Street	Western portion flat; eastern third of site slopes steeply uphill to the east; mostly deciduous trees on site borders (approx. height 20-100 ft.) forming a potential screen from adjacent properties	High

Table 2. Summary of Existing Light Conditions at the Route 9-195th Street Alternative

**Portals (continued)** 

Portals (co	munueu)	T	T	0
Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
Е	Residential and forested	No street lighting on NE 195th Street	Gentle slope uphill to the west, Southeastern portion contains a mixture of evergreen (approx. height 5-30 ft.) and deciduous (approx. height 20-40 ft.), western portion contains few trees, trees form a potential screen on all borders except south (along NE 195th Street)	High
		Porta	al 41	
A	Urban commercial (office park)	Adjacent office parking lots are lit; street lighting on North Creek Parkway and NE 195th Street	Flat land; perimeter lined with trees, forming a potential screen for adjacent properties; northern edge is a mixture of evergreen (approx. height 10-20 ft.) and deciduous (10-50 ft); eastern edge is a mixture of evergreen (approx. height 30-50 ft.) and deciduous (approx. height 100 ft.); southern and western edges are a mixture of evergreen/deciduous (approx. height 30-50 ft.)	Low
С	Commercial, residential, and playground	Adjacent office parking lots are lit; lighting along access drive but no onsite lighting	Moderate uphill to the east, steep uphill just offsite to the east; dense woods in southeastern portion – mixture of evergreen (approx. height 40-50 ft.) and deciduous (approx. height 30-100 ft.); grassy park area in northwestern portion with few trees (approx. height 20-30 ft.) - mostly deciduous and a few evergreen	Low
D	Commercial and grassy park area	Eight large baseball diamond light towers; adjacent office parking lots are lit; street lighting on adjacent roads; the site has a ball field with lights	Flat; trees line perimeter of site, northern and eastern edges contain deciduous trees (approx. height 20-25 ft.); southern and western edges contain a mixture of evergreen and deciduous trees (approx. height 40-50 ft.); trees form a screen along southern and western borders	Medium

Portals (co	ntinued)			
Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
7	Commercial office park; vacant site to the north ready to be developed.	Adjacent office parking lots are lit. Street lighting on North Creek Parkway only to NE 195th Street.	Flat; man-made stormwater drainage channel on the southeast side of the site.  Northern and western borders of the site have some evergreen (approximate height 20 ft.) forming partial screening.  Southeastern side contains a mixture of deciduous trees.	Medium
Х	Urban Commercial	North Creek Pump Station	Flat	Low
W	Residential with some open space	Street light on Beardslee Blvd.	Slope uphill to the west; dense evergreen (approx. height 40-80 ft.) along west side of the site forming screen; mixture of deciduous and evergreen trees (approx. height 20-60 ft.) on the south and southwest part of the site	Medium
		Port	al 5	
В	Commercial and some residential	Street lighting on Ballinger Way NE; parking lot onsite has no lighting	Gentle uphill to the northwest; few conifer trees along perimeter of southern half of site	Medium
G	Commercial	Street lighting on Ballinger Way NE; parking lot lighting	Gentle uphill to the northwest; conifer trees run along perimeter of southwestern border (100+ ft.) forming a screen	Medium
Х	Commercial and some residential	Street lighting on Ballinger Way NE; significant lighting (light poles and floodlights) at the site	Flat; some evergreens along southern edge; 30-ft. deciduous trees between parcels	Medium
		Porta	al 19	
А	Industrial and residential	Street lighting along Richmond Beach Drive NW; nearby parking lot floodlight	Moderate uphill slope to the east	Medium
С	Industrial and residential	Street lighting along Richmond Beach Drive NW; Chevron terminal has lighting adjacent to site	Flat (near sea level) with steep uphill slope just offsite to the east; the site has mostly grass and few trees on eastern half	Medium

Portals (co	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
E	Residential and Puget Sound	Street lighting along Richmond Beach Drive NW; some street lighting along service road through the site	Slightly uphill slope to the east; few trees on perimeter; fenced on all sides with tall bushes and trees	High
Secondary	Portals			
		Port	al 7	
A	Residential, school, and industrial	25th Avenue NE has no street lighting, Ballinger Way NE has street lighting; lighting at Ballinger/25th intersection; no lighting on ball field	Gentle uphill to the north and northeast; fir trees (approx. height 50-70 ft.) on southern and eastern site borders form a screen from adjacent properties; deciduous trees in northeast portion (approx. height 70-100 ft.)	High
В	Residential, school (ball field), and park	25th Avenue NE has no street lighting; Ballinger Way NE has street lighting; lighting at the intersection of Ballinger Way and 25th intersection; no lighting on ball field	Track and field in northeast corner raised (20 ft.) above baseball diamond and tennis court in west/southwest portion; mostly deciduous trees along western and northern borders of site that form a screen from adjacent properties	Medium
С	Residential, park, school (ball field), and industrial	25th Avenue NE has no street lighting; Ballinger Rd NE has street lighting; lighting at Ballinger/25th intersection; no lighting on ball field	Gentle uphill to northeast; part of site is in a park and bog with some trees	Medium
		Porta	al 23	
А	Residential	Significant commercial parking lot lighting; street lighting along 244th Street SW and Firdale Avenue; street lighting	Site is in a low spot with gentle slope uphill to the northeast; few deciduous trees (approx. height 70-100 ft.) in northwest corner of site; northern border may serve as a screen for adjacent property (residential area to north)	High

Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
D	Residential and commercial	Some street lighting off Firdale Avenue	Moderate uphill to the southwest; mature stand of evergreens running southeast to northwest across site (150+ ft.); remaining trees are deciduous (approx. height 30-50 ft.); trees form a screen along western/southwestern portion of site	High
F	Residential	Minimal street lighting	Slight slope uphill to the south, on top of a hill; wooded northwest corner – mostly evergreen (~150 ft.); some deciduous trees located along site borders (<40 ft.)	High
		Porta	al 27	
A	Recreational	Street lighting on N 205th Street; lighting on road into golf course	Gentle slope uphill to the south; golf course with trees, grass, and shrubs, predominantly evergreen trees (60-150 ft) lining fairway running southwest to northeast; a few scattered deciduous trees, trees form a screen to west and southeast; cemetery across N 205th Street	Medium
В	Residential and cemetery	Street lighting on N 205th Street; minimal street lighting on 1st Avenue NE	Hill rising to the south; western portion is a densely-wooded evergreen (approx. height 100-150 ft.) and deciduous (approx. height 50-70+ ft.) mixture	Medium
С	Residential	Street lighting	Located in a relatively low spot (cul-de-sac); gentle uphill slope to west; large stand of evergreens in southwest portion of site (approx. height 70-100 ft.)	High
		Porta	al 45	
A	Residential and church	Street lighting on 55th Avenue NE	Gentle uphill to the west; trees along northern and southern borders are a mixture of evergreen and deciduous (approx. height 10-100+ ft.) and form a screen from adjacent properties	High

Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
С	Residential and church	Street lighting on 55th Avenue NE	Gentle uphill to the west; wooded area, mixture of evergreen/deciduous (approx. height 50-150 ft.), dense in western portion	High
D	Residential, church, and commercial	Street lighting on 56th Avenue and NE 190th St; no lighting in northern portion	Flat; mostly wooded; northern portion is Linwood Park – contains mixture of evergreen/deciduous (approx. height 50-100+ ft); southern extensions contain mostly deciduous trees with a few evergreens; trees form a screen on all borders except north (along NE 193rd Street)	Medium

#### Route 9-228th Street Alternative

Table 3 summarizes the adjacent land uses, major existing light sources, and site topography at the proposed Route 9-228th Street portals. The sensitivity of these sites to potential light and glare impacts, based on these three characteristics, is listed in Table 3.

For the Route 9-228th Street Alternative, Portal 44 and the primary portals along 228th Street (Portals 26, 33, and 39) would be the primary portals most sensitive to light and glare impacts. Two primary portals (Portals 19 and 41) are located in an area of mixed land use and would be relatively less sensitive to light and glare impacts. Portal 11 is located in an industrial area and would be least sensitive to light and glare impacts.

Table 3. Summary of Existing Light Conditions for the Route 9-228th Street Alternative Portals

Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)		
Primary Por	Primary Portals					
	Portal 11					
	Same as 195th Street Alternative					
Portal 44						
Same as 195th Street Alternative						

Portals (co	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
			Portal 41	
		Same as 19	5th Street Alternative	
			Portal 39	
В	Rural residential, commercial, and some open space	Street lighting on 228th Avenue SE	Gentle slope with hill rising to the northeast; northern portion is mainly deciduous (approx. height 30-100+ ft.); southwestern portion becomes predominantly evergreen (approx. height 70-125 ft.); western portion is densely-wooded; eastern portion is residential and contains few trees; trees form a screen in western portion	Low
С	Rural residential	Minimal street lighting on 31st Avenue SE	Uneven, gentle slope uphill to the northeast; southwestern portion of site contains deciduous trees (approx. height 50-60 ft.); northwestern portion contains a mixture of evergreens (150 ft.) and deciduous trees (approx. height 80-100 ft.); clearing in center portion of site; trees form a screen along eastern and southern site borders	Medium
D	Residential and commercial	Minimal street lighting on 31st Avenue SE; street lighting on 228th Avenue SE	Slight slope uphill to the north; few trees; a few deciduous trees in center (approx. height 100+ ft.); small deciduous trees and shrubbery for landscaping use line property edges	Medium
			Portal 33	
A	Residential and some vacant land	No street lighting in vicinity of site—street lighting at intersection	Moderate slope uphill to west; mature deciduous/evergreen tree mixture (approx. height 100-150 ft.) in northern portion; mainly evergreen (approx. height 50-100 ft.) scattered along western boundary	Medium

Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)		
С	Residential and some commercial	Street lighting along 228th Street SW	Mostly flat; mixture of evergreen/deciduous trees (approx. height 100-150+ ft.) along western border; deciduous (~100 ft.) along northern and eastern border; few trees within interior portion of site; trees form a border to east, north, and west	High		
D	Residential	No lighting in vicinity of site; street lighting at intersection of Locust Way and 228th Street SW	In valley; mature wooded area, mainly deciduous trees (approx. height 100+ ft.) and a few scattered evergreens; clearing in center of site extending north; trees form a screen on southern and western borders	High		
			Portal 26			
A	Residential and some open space	Street lighting on Lakeview Drive, ball field has no lighting	Mostly flat; deciduous trees along western border (~50 ft.) form a screen for adjacent property; a few evergreens in far northwest corner of site (approx. height 50-100 ft.)	Medium		
С	Commercial and residential	Street lighting on SR-99; onsite parking lot has no lighting; adjacent parking lots have lighting	Gentle slope uphill to northwest; surrounding area is free of large hills; very few trees	Medium		
D	Residential	Street lighting along 228th Street SW	Hill to the east; relatively flat north, south, and west; some trees, including many 100+ ft conifer trees; trees are in a corridor, interrupted by power lines	High		
	Portal 19					
		Same as 19	5th Street Alternative			

Candidate Site Secondary	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
occorridar y	Tortais		Portal 22	
С	Residential	Minimal street lighting along 8th Avenue NW	Moderate uphill to the east; trees are predominantly evergreen (height ~150 ft.) with a few small deciduous trees used for landscaping (height <20 ft.); some deciduous trees scattered among evergreen (approx. height 60-80 ft.); trees form screen from adjacent properties on all but eastern border	Medium
D	Residential and commercial	Some street lighting off Firdale Avenue	Moderate uphill to the southwest; mature stand of evergreens running southeast to northwest across site (approx. height 150+ft.); remaining trees are deciduous (approx. height 30-50 ft.); trees form a screen along western/southwestern portion of site	High
E	Residential	Minimal street lighting	Moderate slope uphill to the east; some evergreen trees (height ~100 ft); scattered deciduous used for landscaping (height <20 ft.); trees may form screen along northern boundary	High
F	Residential	Minimal street lighting	Slight slope uphill to the south, on top of a hill; wooded northwest corner – mostly evergreen (height ~150 ft.); some deciduous trees located along site borders (height <40 ft.)	High

Portals (co	ntinued)	T		
Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
			Portal 24	
A	Residential and commercial	Street lighting on Edmonds Way; unfinished lighting along northern cul-de- sac	Moderate slope uphill to north in southern portion; north half rises about 100 ft. as a sharp ridge to the north; deciduous trees (approx. height 75 ft.) along slope of ridge in southwestern portion of site; deciduous/evergreen mix (approx. height 100+ ft.) along eastern border (offsite) may form a screen	Medium
В	Residential and vacant land	Street lighting along 228th Street SW; parking lot lighting	Mostly flat; evergreens along the boundaries (north, east, west) are 50-75 ft. tall with some deciduous mixed in (height <50 ft.); a few small landscaping deciduous trees (height <10 ft.) line roadway (southern boundary); trees form a screen along north, east, and west boundaries of site	Medium
С	Residential and some commercial	Street lighting on Edmonds Way; apartments to the east with lighting in parking lots	Moderate slope uphill to the south; dense wooded area, mainly deciduous trees (approx. height 40-60 ft.) with a few evergreens (approx. height 70-80 ft.); entire parcel is wooded	Medium
			Portal 30	
A	Residential, elementary school and open space	Insignificant	Near bottom of steep hill; site is flat; evergreens along northern edge (approx. height 150+ ft.); trees form a screen from adjacent properties to west, north, and possibly to the east	Medium
В	Residential and commercial	Street lighting along 228th Street SW and 35th Avenue W	Moderate uphill slope to the east; trees along parcel borders; mixed evergreen/deciduous (approx. height 10-25 ft.) along 228th Street SW with a few 100+ ft. deciduous, 150+ ft. evergreen and some deciduous between parcels; trees form a screen along southern edge only	High

Table 3. Summary of Existing Light Conditions for the Route 9-228th Street Alternative

**Portals (continued)** 

Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
С	Urban residential and industrial	Street lighting along 228th Street SW	Sharp slope uphill to west; dense mature wooded area; even mixture of evergreen and deciduous trees (approx. height 50-150 ft.)	Medium
			Portal 37	
A	Commercial and residential	Street lighting along 19th Avenue SE	Level; few trees; dense woods (mixture of evergreen/deciduous) offsite to north and south and off to the west	Medium
С	Urban residential and commercial	Street lighting on 9th Avenue SE and 228th Street SE	Gentle slope uphill to the west; dense mixture of evergreen/deciduous trees (approx. height 25-50 ft.) along southern edge bordering 228th Street SE	Medium
D	Urban residential and vacant	Street lighting on 9th Avenue SE	Gentle slope uphill to the west; dense woods in eastern portion – evergreen/deciduous mixture (approx. height 100-150 ft.); western portion contains shorter shrubbery with some scattered evergreens (approx. height 80- 100 ft.)	Medium

#### **Unocal Alternative**

Table 4 summarizes the adjacent land uses, existing light sources, and site topography at the proposed Unocal portals. The sensitivities of these sites to potential light and glare impacts, based on these three characteristics, are listed in Table 4.

For the Unocal Alternative, Portal 14 is located in a commercial area, and along with Portal 11, it would be relatively less sensitive to light impacts. The remaining two primary portals are located in residential and other areas of mixed land use and would be more sensitive to light and glare impacts.

Table 4. Summary of Existing Light Conditions at the Unocal Alternative Portals

Candidate Site	Adjacent land use	Existing Lighting	nditions at the Unocal Alternati Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium, High)
Primary Po	rtals			
			Portal 3	
D	Residential	Lights along east perimeter of the site (Edmonds Way)	Gentle slope uphill to the southwest; stand of evergreens runs along Edmonds Way from southeast to northwest; site is predominantly evergreen (approx. height 125 ft.) with a few scattered deciduous trees (approx. height 75 ft.)	High
E	Rural residential and commercial	Minimal street lighting along 92nd Avenue W; parking lot light in veterinary clinic; lighting along Edmonds Way	Gentle slope uphill to the south located in a low spot; some trees; evergreen (approx. height 150 ft.) with scattered deciduous trees (approx. height 60-80 ft.); trees form a screen on western and southern borders	Medium
F	Rural residential	Minimal street lighting at intersection of 92nd Avenue W and 234th Street SW	Site is in a low spot but very visible from road; forested with many blackberry bushes and scrub trees	High
			Portal 7	
		Same as 1	95th Street Alternative	
			Portal 11	
		Same as 1	95th Street Alternative	
			Portal 14	
А	Urban commercial (office park)	Street lighting along North Creek Parkway; site is a ball field with floodlights	Flat; deciduous trees along western and northern borders; evergreen trees along eastern border; evergreen/deciduous mixture (approx. height 30-50 ft.) along southern border	Low

**Table 4. Summary of Existing Light Conditions at the Unocal Alternative Portals (continued)** 

(continued				Sensitivity to Light/Glare	
Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Impacts (Low, Medium, High)	
В	Urban commercial (office park)	Street lighting along North Creek Parkway; site is a ball field with floodlights	Flat; deciduous trees along western (approx. height 70 ft.) and southern borders (approx. height 25-30 ft.); evergreen/deciduous mix (approx. height 40 ft.) along eastern border; trees on all borders except northern may provide a screen for adjacent properties	Low	
D	Urban commercial (office park)	Street lighting along 120th Avenue NE; lighting along adjacent driveway	Flat; evergreens (height 20 ft.) along southern border and surrounding substation, deciduous within interior area (approx. height 10-12 ft.) and along western border (120th Avenue NE), parking and walkway of commercial services; trees form a screen on all but northern edge	Low	
Secondary	Portals				
Portal 5					
	Same as 195th Street Alternative				
			Portal 10		
А	Residential	Street lighting along Ballinger Way NE	Gentle slope with steep hill rising to the northwest; trees surround the site	High	
С	Residential and church	No street lighting along Brookside Blvd. NE; lighting at the intersections	Gentle slope	High	
D	Commercial and residential	Street lighting along Ballinger Way NE; commercial area has lighting; parking lot lighting	Gentle slope; trees in residential areas	Medium	

**Table 4. Summary of Existing Light Conditions at the Unocal Alternative Portals** 

(continued)

Candidate Site	Adjacent land use	Existing Lighting	Site Topography	Sensitivity to Light/Glare Impacts (Low, Medium,
E	Residential	No street lights on 44th Avenue NE	Gentle slope, some trees	<b>High)</b> High
			Portal 12	
С	Residential and vacant land	Limited street lighting on 80th Avenue NE	Gentle slope uphill to the east; trees concentrated around site borders - mostly deciduous, a few scattered evergreens; southern edge has larger trees (approx. height 100-150 ft.)	High
Е	Residential and vacant land	Limited residential street lighting on NE 185th Street	Gentle slope uphill to the east; no trees on site; deciduous trees offsite along western edge	High
			Portal 13	
A	Open space	Street lighting along Woodinville Drive; street lighting along NE 180th Street; minimal onsite lighting	Flat, in a low-lying area; mostly evergreens (approx. height 30-40 ft.) with a few deciduous trees (approx. height 5-20 ft.) along western edge; deciduous (approx. height 5-20 ft.) along northeastern and southern edges of park area	Medium
В	Park-and- Ride lot, commercial, and residential	Street lighting along Woodinville Drive; minimal onsite lighting	Low-lying area with a slight uphill slope to the north; a few deciduous trees on southern edge near Sammamish River	Medium
С	Park-and- Ride lot, commercial, and residential	Street lighting on Bothell Way NE and NE 180th Street; lights in McDonald's parking lot on western border	Low-lying area with a slight uphill slope to the north; deciduous trees (approx. height 20-40 ft.) along NE 180th Street (southern border); remaining borders marked by deciduous trees with a few evergreens (approx. height 20-40 ft.); existing trees form screens along all borders	Medium

## **Impacts**

Conveyance light and glare impacts may occur as a result of the lighting provided at portal construction sites and security/exterior lighting at the permanent facilities. Light and glare impacts are attributable either to a substantial increase in ambient light levels at locations

near the light source or to the visual impact of a new light source in a previously unlighted area as viewed from locations distant from the light source.

#### **Construction**

#### Impacts Common to All Conveyance Systems

Although project construction activities would take place as much as possible during daylight hours, some work at the portal sites (particularly during winter months) would require the use of supplemental lighting. In addition, security lighting would be required at all times during nighttime hours to ensure safety.

Construction lighting must be sufficiently bright to illuminate work areas and could cause temporary significant increases in nearby light and glare levels. These impacts would be limited to the construction period at the portals (between one and four years) and would be minimized by the use of downcast lighting fixtures and other measures to shield light sources as described in the *Mitigation* section.

Light and glare impacts during construction of the conveyance facilities could result from the following activities:

- General site lighting. Site lighting, similar to ball field lighting, will be installed to provide security and/or workers' safety if construction outside of daylight hours is planned.
- Portal site lighting. This might be used if equipment repair, material assembly, or other construction activities are required outside of daylight hours.
- Stockpile lighting. Spoils maybe stockpiled at night and removed by truck during the day. This would result in task-specific lighting of the stockpile.
- Portal excavation lighting. Excavation of the portals may continue at night, which would result in portal and excavation stockpile lighting at a task-specific level.
- Nighttime construction vehicle traffic. If vehicles are driven to and from the portal at night, the light from their headlights would increase lighting. The onsite routing of vehicles affects the direction of headlight beams.
- Equipment operating at the portals at night might shine lights onto and/or into nearby buildings.

#### Route 9-195th Street Alternative

The Route 9-195th Street Alterative would require five primary portals (Figure 1). Construction activities would range from one year at Portal 5 to four years at Portal 44 (Table 5).

Table 5. Summary of Route 9-195th Street Primary Portal Construction Duration and Aboveground Permanent Facilities

Portal	Portal Vicinity	Construction Duration (years)	Permanent Aboveground Facilities
5	NE 205th Street and Ballinger Way NE (SR-104)	1.0	Odor Control Facility Dechlorination Facility
11	NE 175th Street and 68th Avenue NE	2.0 – 2.5	Odor Control Facility
19	NW 205th Street and Richmond Beach Drive NW	3.5 – 4.0	None
41	NE 195th Street and 120th Avenue NE	3.0	Odor Control Facility
44	NE 195th Street and 80th Avenue NE	3.5 - 4.0	Odor Control Facility

The potential impacts of lighting during construction (and operation) at the Route 9-195th Street Alternative portals would be influenced primarily by the:

- Existing conditions as summarized in the *Affected Environment* section (i.e., adjacent land use, existing lighting, and topography)
- Construction duration as summarized in Table 5
- Areas that can view the portal sites (Table 6)
- Areas where light could trespass, such as adjacent residences or roadways (Table 6)

The specific potential light and glare impacts for the Route 9-195th Street Alternative portals are listed in Table 6. The site-specific information listed in Table 6 focuses on where light at the portals could potentially be seen and where construction lighting would likely trespass (such as adjacent buildings or roadways). (Note: the site-specific information can also be used for assessing operational light impacts at those portals that require aboveground facilities.) Light and glare impacts should be minimal for people within retail and commercial buildings. However, potential light and glare impacts could occur to adjacent residents or people driving along the nearby roads. Glare may be an issue for vehicles driving at night.

Table 6. Potential Light and Glare Impacts at the Route 9-195th Street Alternative Portal Sites

Candidate Site	Potential Impacts
Primary Po	rtals
	Portal 11
А	Light from the site could potentially be seen from commercial buildings to the south, north, southeast, northeast, and by residences on the hill to the northwest; light from the site could potentially trespass to adjacent buildings; light from the site could potentially Impact the traffic from NE 175th Street, NE Bothell Way, and Juanita Drive NE
В	Light from the site could potentially be seen from commercial buildings to the southeast, northeast, and by residences on the hill to the northwest; light from the site could potentially trespass to adjacent buildings; traffic along NE 175th Street and Juanita Drive NE could potentially be impacted by light

Table 6. Potential Light and Glare Impacts at the Route 9-195th Street Alternative Portal Sites (continued)

	es (continued)
Candidate Site	Potential Impacts
С	Light from the site could be seen from surrounding buildings and roads (NE 181st Street, 68th Avenue NE, residences on the hill to the west); light could potentially trespass to adjacent buildings
	Portal 41
Α	Light from the site could potentially be seen from North Creek Parkway, NE 195th Street and adjacent office buildings to west and south
С	Light from the site could potentially be seen from NE 195th Street, NE Hollyhills Drive, and adjacent office buildings
D	Light from the site could potentially be seen from 120th Avenue NE and from adjacent office buildings
J	Light from the site could potentially be seen from NE 195th Street, North Creek Parkway and adjacent office buildings to the south.
Χ	Light from the site could potentially be seen from office buildings to the south and north
W	Light from the site could potentially be seen from Beardslee Blvd., I-405, NE 195th Street, and residences on Ross Rd.
	Portal 44
С	Light from the site could potentially trespass to adjacent buildings; light from the site could impact the traffic along 80th Avenue NE
D	Light from the site could be seen from 80th Avenue NE, NE 195th Street, and NE 192nd Street, and residences on NE 195th Street; light from the site could potentially trespass into residences and buildings adjacent to the site
Е	Light from the site could potentially be seen by adjacent buildings/residences to the north, west, and south, and NE 195th Street
	Portal 5
В	Light from the site could be seen from adjacent commercial buildings along Ballinger Way NE, from Ballinger Way NE, and from residences adjacent the south half of the site; light from the site could potentially trespass to adjacent buildings
G	Light from the site could potentially be seen from adjacent commercial buildings along Ballinger Way NE, from Ballinger Way NE
Х	Light from the site could potentially be seen from surrounding commercial buildings along Ballinger Way NE, and from Ballinger Way NE, 15th Avenue NE and the intersection of 244th Street SW and Ballinger Way NE
	Portal 19
Α	Light from the site could potentially be seen by adjacent residences to northwest and from roads adjacent to and overlooking the site.
С	Light from the site could potentially be seen by adjacent industrial facilities to the north and from residences and roads adjacent to and overlooking the site and Puget Sound
Е	Light from the site could potentially be seen by adjacent residences to the north, east, and south and from roads adjacent to and overlooking the site and Puget Sound

Table 6. Potential Light and Glare Impacts at the Route 9-195th Street Alternative Portal Sites (continued)

Portai Site	s (continued)
Candidate Site	Potential Impacts
Secondary	Portals
	Portal 7
Α	Residences from the north, south, and west could potentially see light from the site; light from the site could impact traffic on 25th Avenue NE
В	Residences from the north, south, and west could potentially see light from the site; light from the site could potentially impact traffic along Ballinger Rd. NE and 25th Avenue NE
С	Residences from the north, south, and west could potentially see light from the site; light from the site could potentially impact traffic along Ballinger Rd. NE and 25th Avenue NE
	Portal 23
A	Light from the site could potentially be seen by residences uphill from all directions and could trespass to adjacent buildings; glare may be a problem for vehicles driving at night along Firdale Avenue and 244th Street SW
D	Light from the site could be seen by residences to the northeast, southwest, and from roads adjacent to the site; light from the site could potentially trespass to buildings and roads adjacent to the site
F	Light from the site could be seen by residences in all directions except northeast and from roads (244th Street SW and 5th Avenue NW) adjacent to the site; light from the site could potentially trespass to buildings and roads adjacent to the site
	Portal 27
А	Potential for light from the site to be seen from Lake Ballinger residences and N 205th Street
В	Light from the site could be seen from residences to the west and north and residences on Ballinger Lake, N 205th St, and 1st Avenue NE, light from the site could potentially trespass into adjacent residences and buildings
С	Light from the site could be seen from locations on the lakeshore, adjacent residential roads, buildings, and residences; light from the site could potentially trespass into adjacent residences and buildings
	Portal 45
А	Residences in all directions and 55th Avenue NE could see light from the site; light from the site could potentially trespass to adjacent buildings and residences
С	Adjacent residences to the east, south, and west, and 55th Avenue NE could see light from the site; light from the site could potentially trespass to adjacent buildings and residences
D	Light from the site could be seen by residences uphill to northwest, west, and southwest and residences adjacent to the site; light from the site could potentially trespass to adjacent buildings and residences; light may impact the traffic along NE 190th Street and NE 193rd Street

#### Route 9-228th Street System Alternative

The major difference between the Route 9-195th and the Route 9-228th Street Alternatives that would affect light impacts during construction is that the Route 9-228th Alternative would require construction activities at three additional portals along 228th Street (Portals 39, 33, and 26), but would not require construction at Portal 5. The three portals along 228th

Street are located primarily in rural residential land uses, with some candidate sites located within commercial areas. Construction activities at the portals along 228th Street are expected to last between 1 and 3.5 years.

As shown in Table 7, the Route 9-228th Street Alternative would have the same light impacts as the Route 9-195th Street Alternative at Portals 11, 19 and 41. Construction activities at Portal 44 for the Route 9-228th Street Alternative would be expected to last three years as compared to four years for the Route 9-195th Street Alternative.

Table 7. Summary of Route 9-228th Street Alternative Primary Portal Construction Duration and Aboveground Permanent Facilities

Portal	Portal Vicinity	Construction Duration (years)	Permanent Aboveground Facilities
11	Same as Route 9-19	5th Street Alternative	)
19	Same as Route 9-19	5th Street Alternative	)
26	228th Street SW and Lakeview Drive	1.0	Dechlorination Facility Odor Control Facility
33	228th Street SW and Locust Way	3.0 - 3.5	None
39	228th Street SE and 31st Avenue SE	3.0	None
41	Same as Route 9-19	5th Street Alternative	?
44	NE 195th Street and 80th Avenue NE	3.0 - 3.5	Odor Control Facility

Table 8. Potential Light and Glare Impacts at the Proposed Route 9-228th Street Alternative Portal Sites

Candidate Site	Potential Impacts			
Primary Po	rtals			
	Portal 11			
	Same as 195th Street Alternative			
	Portal 44			
	Same as 195th Street Alternative			
	Portal 41			
	Same as 195th Street Alternative			
	Portal 39			
В	Light from the site could be seen from the office buildings to the north, residences to the east, 228th Street SE, 29th Drive SE; light from the site could potentially trespass to adjacent buildings			
С	Light from the site could impact traffic along 228th Street SE; light from the site could be seen from residences to the east, west, and north; light could potentially trespass to adjacent buildings			

Table 8. Potential Light and Glare Impacts at the Proposed Route 9-228th Street Alternative Portal Sites (continued)

	Alternative Portal Sites (continued)				
Candidate Site	Potential Impacts				
D	Light from the site could be seen from residences in all directions, 31st Avenue SE, and residences or buildings above/below on the hill; light from the site could potentially trespass to adjacent residences and buildings				
	Portal 33				
Α	Light from the site could be seen from residences to the south and west and from residential roads				
С	Light from the site could be seen from adjacent roads (Locust Way, 228th Street SW), an residences on the hill to the west and nearby to the north, east, and south				
D	Light from the site could be seen from residences nearby to the east and south, Locust Way, and 228th Street SW				
Portal 26					
А	Light from the site could be seen from residences and buildings to east, north, west, and southwest; light from the site could potentially trespass into adjacent residences; traffic on Lakeview Drive could potentially be impacted from the glare of the light from the site				
С	Light from the site could be seen from residences to the south and east, commercial areas to the north and west, SR-99, and 224th Street SW; light from the site could potentially trespass into adjacent buildings and residences				
D	Light from the site could potentially be seen from residences and buildings from the east, north, west, and southwest, 228th Street SW, and 74th Avenue W				
	Portal 19				
	Same as 195th Street Alternative				
Secondary	Portals				
-	Portal 22				
С	Light from the site could be seen by residences to north, east, and south, 8th Avenue NW, and local residential roads; light from the site could potentially trespass into buildings and roads adjacent to the site and could be visible from Puget Sound				
D	Light from the site could be seen by residences to the northeast and southwest, and Firdale Avenue; light from the site could potentially trespass into buildings and roads adjacent to the site				
Е	Light from the site could be seen from residences to the east, south, and west, and local residential roads; light from the site could potentially trespass into buildings and roads adjacent to the site				
F	Light from the site could be seen from residences in all directions but northeast, 5th Avenue NW, and 244th Street SW, light from the site could potentially trespass into buildings and roads adjacent to the site				
Portal 24					
A	Light from the site could potentially be seen from residences on hills to the north, south, and southeast, and from commercial areas to the west (gas station), Edmonds Way and local residential roads; light from the site could potentially trespass into buildings adjacent to the site and impact traffic on Edmonds Way and other local roads				
В	Light from the site could potentially be seen from residences to the north, east, and west, church to the south, 228th Street SW, and local residential roads				
С	Light from the site could potentially be seen from residences on hill to the north and south, and commercial area to the east; drivers along Edmonds Way could potentially see light; light from the site could potentially trespass into adjacent buildings				

Table 8. Potential Light and Glare Impacts at the Proposed Route 9-228th Street Alternative Portal Sites (continued)

Internative Potati Sites (continued)				
Candidate Site	Potential Impacts			
Portal 30				
А	Light from the site could potentially be seen from residences to the north and west, and the school to the southeast; light could potentially trespass into adjacent buildings			
В	Light from the site could potentially be seen from residences to the north, east, south, and west and where trees are cleared for power lines; traffic on 228th Street SW, 35th Avenue W, and 228th Street SW could see light from the site; light from the site could potentially trespass into adjacent buildings and residences			
С	Impacts would likely be minimal; light from the site could potentially be visible from adjacent residences and roads			
	Portal 37			
А	Light from the site could potentially be seen from businesses and residences to the east, northeast, and southeast on hill; traffic on 195th Avenue SE could potentially see light from the site			
С	Light from the site could potentially be seen from 9th Avenue SE and from adjacent roads, residences to the north and west, and commercial areas to the east; light from the site could potentially trespass into adjacent buildings			
D	Light from the site could potentially be seen from residences to the west, commercial areas to the south, and 9th Avenue SE; light from the site could potentially trespass into adjacent buildings.			

#### Unocal Alternative

The Unocal Conveyance Alternative would require fewer portals than the Route 9 Alternatives, and with the exception of Portal 11, the portals are in different locations (Figure 3). The Unocal portals are sited in mixed residential (Portals 7 and 3) and commercial (Portal 14) land uses.

The Unocal Conveyance Alternative would include the construction of a pump station at Portal 11 and would therefore extend the construction period an additional 1.5 years compared with the Route 9 Alternatives. Portal 11 is located in an industrial area, with many sources of existing nighttime light.

**Table 9. Summary of Unocal Alternative Primary Portal Construction Duration and Aboveground Permanent Facilities** 

Portal	Portal Vicinity	Construction Duration (years)	Aboveground Permanent Facilities
7	Ballinger Way NE and 25th Avenue NE	3.0	Odor Control Facility
11	NE 175th Street and 68th Avenue NE	3.5 – 4.0	Odor Control Facility Pump Station
14	North Creek Pkwy. and 120th Avenue NE	1.0	Odor Control Facility

**Table 10. Potential Light and Glare Impacts at the Proposed Unocal Street Alternative Portal Sites** 

Portal Sites				
Candidate Site	Potential Impacts			
Primary Po	rtals			
-	Portal 3			
D	Residences on the east and west and motorists along Edmonds Way could potentially be affected by lighting used during construction.			
E	Light could be seen from residences uphill to the north, south, and east, Edmonds Way, and local residential roads; light from the site could potentially trespass into adjacent buildings			
F	Light from the site could be seen from residences to the south, Edmonds Way, and local residential roads; light from the site could potentially trespass into adjacent buildings; glare may be a problem for vehicles driving at night; the adjacent roads have minimal lighting and the site is higher than the road			
	Portal 7			
	Same as 195th Street Alternative			
	Portal 11			
	Same as 195th Street Alternative			
	Portal 14			
Α	Light from the site could be seen from office buildings to the east and west, and from Nort Creek Pkwy. S; light from the site could potentially trespass into adjacent buildings			
В	Light from the site could be seen from office buildings to the east, north, and west, and from North Creek Pkwy. S; light from the site could potentially trespass into adjacent buildings			
D	Light from the site could potentially be seen from the office park to the west and south, and from residences on the hill to the east, 120th Avenue NE, and North Creek Pkwy. S			
Secondary	Portals			
	Portal 5			
	Same as 195th Street Alternative			
	Portal 10			
Α	Light from the site could potentially be seen from residences on the hill to the northwest			
С	Light from the site could potentially be seen from Brookside Blvd. NE, NE 178th St, and from a church to the northeast and residences to the southeast			
D	Light from the site could potentially be seen from Ballinger Rd. NE and residences to the east			
E	Light from the site could potentially be seen from adjacent residences uphill to the northeast and could trespass into adjacent buildings			
	Portal 12			
С	Light from the site could potentially be seen from residences in all directions; light could potentially trespass into adjacent buildings			
Е	Light from the site could potentially be seen from residences to the north, south, and east, and from NE 185th Street; light could potentially trespass into adjacent buildings			

Table 10. Potential Light and Glare Impacts at the Proposed Unocal Street Alternative Portal Sites (continued)

1 of tal Sites (continued)			
Candidate Site	Potential Impacts		
Portal 13			
A	Light from the site could potentially be seen from residences to the west, along the Sammamish River, from the hill to the south, and from commercial buildings to the north; motorists along Bothell Way NE, 180th Street and Woodinville Drive could potentially be affected by lighting used during construction		
В	Light from the site could potentially be seen from residences to the east, along the Sammamish River and Bothell Way NE, Main Street and Woodinville Drive, from the hill to the south, and from commercial buildings to the north. Light from the site could potentially trespass into adjacent residences to the east		
С	Light from the site could potentially be seen from residences to the south on the hill, along the Sammamish River and Bothell Way NE and NE 180th Street, and from the hill to the south and from commercial buildings to the north; light from the site could potentially trespass into adjacent buildings		

## Operation

Operation of the conveyance pipelines is expected to result in minimal additional light and glare because the conveyance pipelines would be underground. However, any aboveground facilities for dechlorination, tunnel access, odor control, and/or ventilation located at portal sites would be equipped with outdoor security lighting. Increase in lighting at permanent aboveground facilities may consist of something similar to a light mounted on the wall above an entrance door. Additionally, parking lot lighting might be installed. Illumination from these facilities is expected to have minimal impact on neighboring properties because the lights would be of minimal wattage. To minimize impact, design of lighting at conveyance facilities would follow the IESNA standard applicable to the area in which the specific facility was located as well as the guidelines of the International Dark-Sky Association (IDA).

#### **Route 9-195th Street Alternative**

The Route 9-195th Street Alternative would require construction of permanent aboveground facilities at four of the five portal locations (Table 5).

#### **Route 9-228th Street Alternative**

The Route 9-228th Street Conveyance Alternative would have the same potential operational light impacts as the Route 9-195th Street Alternative with the exception of an additional odor control facility and dechlorination facility at Portal 26 (Table 7). Permanent aboveground facilities at the remaining two portals (Portals 33 and 39) along 228th Street are not currently proposed and, therefore, there would be no operational light impacts at these portal locations.

#### **Unocal Alternative**

The Unocal Conveyance Alternative could require odor control facilities at each of its three portal locations (Table 9). In addition, the Unocal Conveyance Alternative would also

require the construction of a pump station at Portal 11. The pump station for the Unocal Conveyance Alternative is located in an industrial area near major sources of nighttime light; therefore, significant light impacts are not anticipated during operation.

## **Mitigation**

#### Construction

Potential mitigation measures for light and glare impacts could include the following:

- Install light fixtures including shades to focus the light downward in a controlled manner
- Plant landscape vegetation (trees, tall shrubs) to block light
- Locate the construction operations to minimize impacts on nearby and/or adjacent properties
- Install screening to block vehicle lights from shining into and/or onto adjacent properties
- Turn off lights when not required

#### Operation

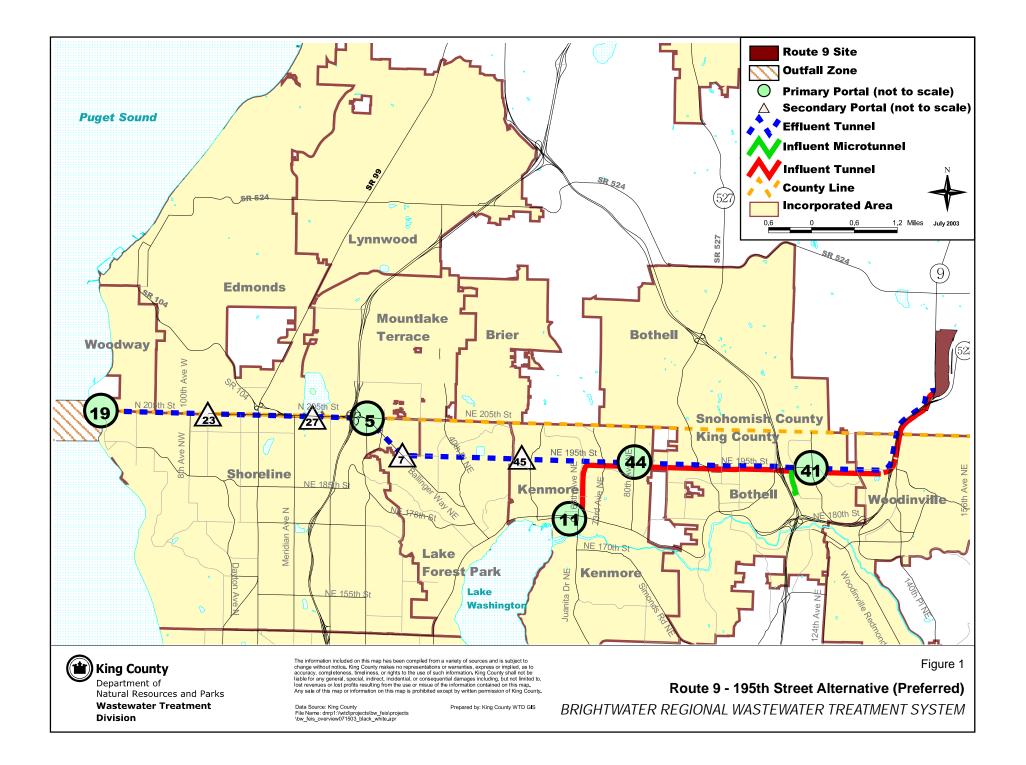
Significant light and glare impacts are not anticipated at the permanent aboveground facilities associated with the conveyance system. Lighting at the conveyance permanent facilities would comply with IESNA standards and could include:

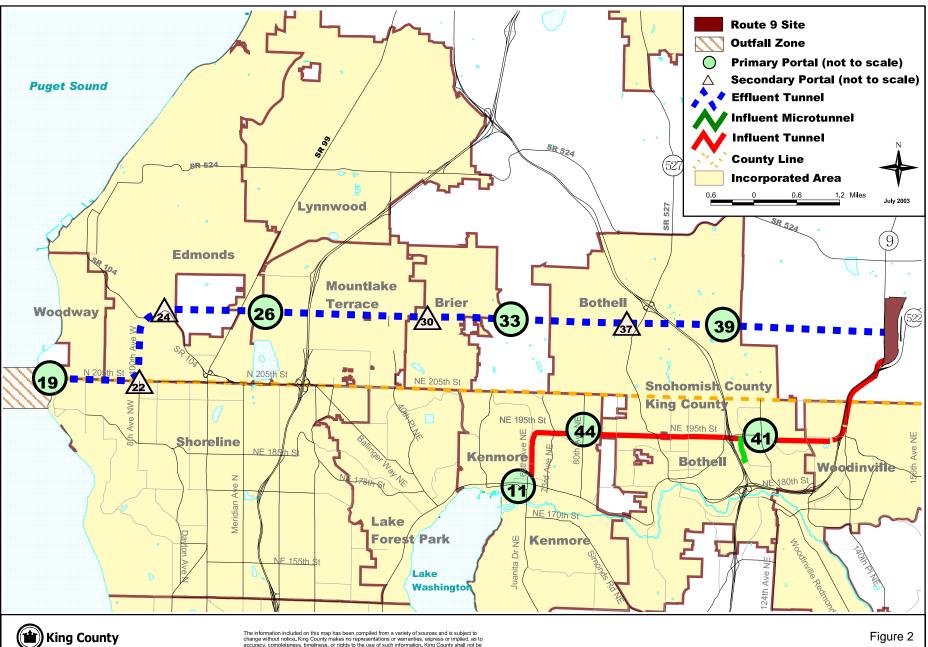
- Use luminaires with cutoff optics. Cutoff optics direct the light downward so that no light is directed above 90 degrees from the plane passing through the light
- Provide dusk-to-dawn lighting only in areas where it would be required for safe egress and operator safety. Reduce light levels after 10 p.m. to the minimum levels required for security and safety
- Provide switchable task lighting in areas where detailed inspections will be required after dusk
- Limit luminaire mounting height to 25 feet, where practical
- Limit outdoor lamp wattage to 250 watts, except for switched task lights
- Avoid the use of floodlighting
- Use cutoff-type lights around the perimeter of areas that require lighting; aim these lights toward the site and away from the surrounding areas. If necessary, add "house-side" shields to further minimize the light trespass

## References

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State of Washington. 2001. Provide and Maintain Adequate Lighting. *Washington State Administrative Code (WAC)*, WAC 296-800-21005.





Department of Natural Resources and Parks **Wastewater Treatment** Division

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**Route 9 - 228th Street Alternative** 

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